MIDWEST ADMINISTRATION CENTER
The University of Chicago
Vol. IX February 1961 No. 6

Administrator's Notebook

Educational Technology: A Way to its Assessment

JOHN O. FRITZ, Assistant Professor of Education
and Director, Audio Visual Center, University of Chicago

Current developments in the use of such devices as language laboratories, instructional television, and the teaching machine have created problems regarding their appropriate role in the teaching-learning process. Just how "instruction by machine" fits into the current organization of educational programs is a problem which must be solved by educators at all levels. If a teaching medium is used without proper regard for the character of existing educational structure, it could lead to internal dislocation that might undermine the overall effectiveness of the educational program. The introduction of filmed or televised instruction, for example, involves more than simply *adding* an additional instructional resource. Specifically, a decision to participate in the Midwest Airborne Television Project can create problems in scheduling, selection and appropriate pacing of content, obtaining and maintaining electronic equipment, modifying plant structure, and allowing for the participation of classroom teachers. If "instruction by machine" is to be effective, we must provide for these and other variables existent within the educational system.

Administrator's Notebook
published monthly, September through May, by the
MIDWEST ADMINISTRATION CENTER
The University of Chicago
5835 Kimbark Avenue, Chicago 37, Illinois

ROALD F. CAMPBELL .....*Director*
LUVERN L. CUNNINGHAM.....*Editor*
SAM GOLDMAN.....*Asst. Editor*

The Midwest Administration Center sponsors a co-operative program of research and action designed to contribute to the improvement of educational administration.

Annual subscription to the *Notebook* (September through May), $2.00. Single copy of any issue, 25 cents. Quantity discounts are available. Address all inquiries to the editor.

Copyright 1961 by The University of Chicago

Educational Technology: Two Roles

Before a decision is made regarding the use of technology in education, it is important to distinguish between two basic roles which instructional devices can serve.

The traditional use of audio-visual media is based upon the concept of *supplementary* aid. In practical terms, the underlying premise of this role maintains that an audio-visual aid be used only when the teacher in person cannot perform successfully a particular teaching task himself.

By contrast, a new concept is emerging--the *complementary* role of audio-visual media in instruction. The underlying premise of this role is: where any task in instruction can be performed by a technological device at least as effectively as though a teacher were doing it, then such a task should be assigned to this device.

The complementary role can best be understood when described in terms of two related criteria--absolute advantage and comparative advantage. A technical device has an absolute advantage when it is the only means whereby certain learnings may be effected. To illustrate, students can see, in microscopic detail, the actual growth of a yeast cell only via the motion picture film.

The comparative advantage of such media as film, television, and tape recordings suggests that these devices be delegated the task of providing that part of the instruction which they can perform as effectively as the teacher, and leaves to the teacher the task of interacting with the students in ways that lead to deeper insights into the particular unit of instruction.

Facilitating Operations

Three interrelated facilitation opera-

tions can be observed in the organization and conduct of an educational program. These are, *standardization*, *specialization*, and *integration*.

Standardization

Standardization refers to the formation of a message, or a series of messages, which is transmitted by a selected medium of communication to one or more students. Often the process of framing or encoding these messages occurs at a point removed in time and/or place from the point of reception and response. Standardization is absolute when messages remain constant and do not change in response to the unique needs of the receiver of the instruction.[1]

This does not imply that standardization is necessarily bad. In order to realize our traditional goal of wider access to education, standardization becomes an obvious and necessary condition. Textbooks, teacher study guides, student work books, educational motion pictures, tape-recorded lectures, televised lecture-demonstrations, and even conventional teacher instruction in the classroom must rely upon a standardized series of messages to accomplish desired instructional objectives.

However, one of the inevitable consequences of standardized communication is either excessive or deficient redundancy in the instructional process. The instruction becomes too repetitive and slow in pace for the able student, or it is too ambiguous, difficult, and too rapidly paced for the slow student. Writers and teachers use a number of techniques to deal with this problem, but each has its attendant disadvantages. A textbook author who adds another example or two to illustrate a concept makes redundancy excessive in a message that is already clear to the able reader. The teacher who attempts to challenge the more able students in the class runs the risk of accentuating simultaneously the difficulties sensed by the slower students in the group. Such attempts to accommodate *each* student in the group by message amplification or differentiation through the *same* communication channel is bound to lead to excessive or deficient redundancy for students at various points in the process.

Another more effective, though more costly, method of differentiating message input in instruction is to use multiple messages in a number of similar or different channels. The primary grade teacher uses several readers of carefully graded difficulty for her class; the language teacher prepares two or three separate practice tapes representing varying degrees of difficulty for use by students in the language laboratory. A teacher may similarly obviate some of these problems created by message standardization by restricting the size and heterogeneous character of the intended student audience. In addition, the "closer" or more proximate the point of formulating instruction to the ultimate destination and intended student receivers, the more appropriate the standardized message input will be to the demands and requirements of the receiving situation. Given equal competence among staff, for instance, a televised presentation, planned and originated by and within a school system, would probably exceed in effectiveness one that is originated "outside" the system.

Specialization

A school program, with its complex pattern of operation, invariably requires specialization among selected task agents. *Specialization* as a second facilitating operation suggests that some discriminating assessment must be made in allocating instructional tasks to the different technical and human agents in the system.

By applying the criterion of comparative advantage, we can assign those teaching operations to technical media where teaching may take place without loss in instructional effectiveness. Lecture-demonstrations, such as those performed by physicists in the Physical Sciences Study Committee physics curriculum, have been placed on film with the expectation that students will learn at least as well, or better, than if the demonstration were performed directly by the local teacher in the science laboratory. Similarly, much that comprises classroom instruction today could, in all probability, be recorded on some technological device without much reduction in effectiveness. The teacher is then freed to direct more attention to the performance of those functions which call for the insightful discrimination of the diagnostician and the therapist in resolving learning problems and in the continuing reconstruction of the student's environment to facilitate individual learning.

The effectiveness of the teacher will be determined by (1) the extent to which he is enabled to make an accurate and continuing assessment of student feedback, and (2) the degree to which the teacher can institute appropriate modifications in the subsequent pattern of student learning activities in greater accommodation of his prevailing needs, interests, and expectations. More specifically, a teacher's greatest contribution may be made when, in individual and small group discussions, students and teachers interact to sharpen student competencies in active deliberation and critical inquiry. In fact, it is exactly in this type of instructional situation, highly personalized through direct face-to-face interaction, that the teacher is challenged to demonstrate the highest level of professional conduct of which he is capable.

Another manifestation of specialization occurs among the different specialists and teachers in the organization. It is expected that as technology is exploited in complementary fashion it will become increasingly necessary for teachers to direct more attention to broad program planning and implementation. Specialists with various skills will be needed to assist the teachers in this task. Educational technology will require that we clarify and define more precisely the roles of administrative staff, curriculum supervisors, instructional media specialists, librarians, and student counselors.

Integration

Any activity which draws upon the participation of a number of individuals with a variety of skills and responsibilities must be coordinated and controlled if the enterprise is to be successful in accomplishing its objectives. Administrators will have to maintain the harmonious and compatible operation of the various components of instruction (human and machine), assess the relative contribution of individual components, and regulate all processes within the organization.

Teachers will need to appraise and compare the potential value and relevance of standardized instruction, planned, encoded, and originated from points distant from the immediate learning environment; they will have to make careful selection of those audio-visual media that lend themselves, economically and technically, to the local preparation of instructional materials. In addition, they will face the all-encompassing question: What learning experiences are to be generated toward what learning objectives, through what ways of mediating devices, under what facilitating physical conditions, with what groups, and for what periods of time? In answering this question, the teacher joins the administrator in the constant modification and refining of the model of instructional resources as new, more promising configurations of the component parts emerge.

Instructional Continuum: Mass ⟷ Individualized

Of present concern to educators is the growing emphasis on individualized instruction at a time when an increasing number of schools are experimenting with large groups of mass instruction in team teaching projects or through television or film. The implicit distinction between individualized and mass instruction is now made primarily in terms of numbers of students taught at a given time and place. Rather than use numbers of students as the criterion, it is proposed that *mass* and *individualized* instruction be differentiated by the degree of rigidity in communication that facilitates interaction between teacher and student. Hence, mass and individualized become opposite poles, forming a continuum of relative rigidity or flexibility in the communication chain that interrelates teacher and student.

The two poles representing extreme forms of instruction differ by virtue of the amount of *psychological distance* "separating" the source and receiver in the communication process. Psychological distance is one measure of the adaptability of the communication chain to the demands and requirements of the receiver in the receiving situation. Psychological distance is minimized when the form of communicative interaction approaches personalized instruction involving a teacher and a student in a face-to-face situation. It is greatest in instances when content is encoded and recorded by videotape, film, or magnetic tape and subsequently disseminated at another time and place to one or any number of students simultaneously. Student responses at any given point in the process cannot serve to affect the construction (encoding, pacing, etc.) of succeeding

messages in the sequence since these have already been predetermined or standardized.

The effects of rigidity in the communication chain may, however, be reduced by the availability of supporting messages from an additional source. The teacher, for instance, may make significant introductory comments before the class views a televised lesson originating from an external and psychologically distant source. Similarly, where instruction via television is presented "live" and is originated and controlled locally, students and teachers in the receiving classrooms may be instrumental in affecting the content and format of succeeding presentations. Here, psychological distance is less because students and teachers are exposed not only to the messages but have subsequent, if not immediate, access to the originating source--the television teacher. To the extent that psychological distance is diminished, the communication system, which facilitates the instruction, can adapt itself more effectively to the character of the receiving situation in order to increase the probability of realizing intended educational outcomes.

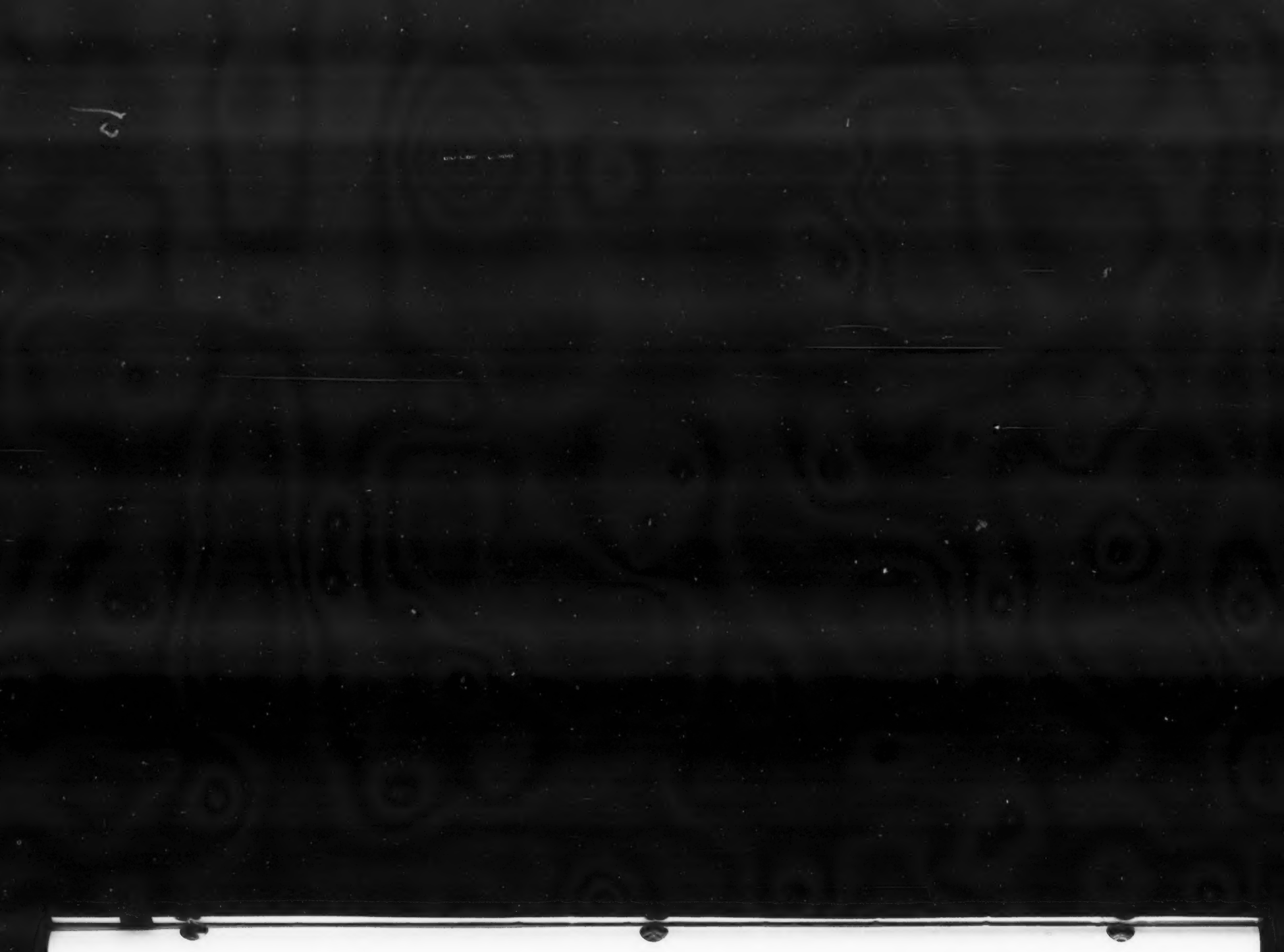
Increased student access to a school's instructional resources diminishes psychological distance since the student acquires greater *control* over the communication process. Due to the capacity of some audio-visual media to record and "store" instruction, the student is enabled to avail himself of teaching resources at times other than formally designated class periods and without the personal intervention of the teacher. Where schools provide "free access" to instruction on film, filmstrips, and locally prepared slide-tape presentations, the student has greater freedom to "expose" himself to such instruction at a time when he would presumably feel more ready and more receptive and responsive to it. Also, such access permits the student to pace himself more effectively. The student who has missed an important class presentation and another who is eager and ready to move ahead are not hampered by the rigidity of a predetermined class schedule.

A student paces himself in another, more specific fashion as he adjusts his rate of reading to the "difficulty" of the paragraph or chapter in a book; he may stop the tape-recorder to "catch up" with the presentor or he may replay a portion that he failed to understand. The teaching machine or, more accurately, programmed instruction, provides the student a carefully developed, progressive series of standardized messages and the opportunity to regulate the rate of teaching in accordance with his rate of learning. The student, by controlling the rate of his exposure to instructional messages, eventually establishes a learning pattern that is more comfortable and appropriate for him.

Branching is another way in which technological devices can individualize instruction. Programmed instruction, for instance, provides the student with a standardized series of small conceptual steps to learning. This process is internally self-adjusting since the student can select from the available possibilities those messages whose difficulty "fit" his present capacity.

Summary

The administrator must view educational technology and its potential role in the instructional program in terms of the total educational enterprise. It is important to note that standardization is not only a prominent facilitating operation in educational practice today but is necessary in meeting the current and future demands for education; that mass instruction, as here defined, can serve useful purposes; that the complementary use of technology through the exploitation of its absolute and comparative advantages promises to relieve teachers from largely expository, repetitive, and duplicating teaching tasks; that, as the teacher is enabled to specialize in new emerging roles, he becomes more instrumental at crucial junctures in influencing student perceptions, decisions, and actions through more frequent, personalized interaction with the individual learner. These concepts and related propositions may assist the administrator and teacher to guide and control the entree of technology into education. Careful and intelligent planning by both is vital, for the impact of their decisions will be lasting and perhaps irreversible.

---

[1] Throughout the discussion, the teacher is usually referred to as the "source" of messages and the student as the "receiver" of those messages. Such description is used for the sake of brevity and does not imply that the teaching-learning process is a one-way communication. Teachers and students alternate roles as "sources" and "receivers" of messages.